

No 33 J. G. 5th. - 1813

#6

An Experimental Essay
on
Camphire
1813

By
Robert Bitterhouse Barton
No 33

Robert Bitterhouse Barton

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That particular substance, called Camphor, appears to have been
very early known, more especially by the Arabian Physicians. It is
procured from many of the Asiatic Islands, particularly from Japan
and Borneo. Though its use as a medicine is of great antiquity and
ever since its introduction into Materia Medica it has been consid-
ered an important article; yet its natural history is still dark
Gul. Until very lately it was thought to be obtained from the
Laurus Camphora; but from Dr. Rossburg's letter to Dr. Barton
it appears, that we have been entirely deceived. The tree from
which it is obtained (agreeably to this information) is the *Shorea*
a tree totally different from any species of *Laurus*. Whether
this be the only source from which the camphor of commerce
is obtained, or whether it be also obtained from the *Laurus Cam-*
phora are questions of no material importance. We are
certain that it may be obtained from two species of *Laurus*
the *Bursera* & *Sassafras* which are natives of the United States.
Altho they contain it, agreeably to Dr. Barton, in great a-
bundance its extraction however has never been attempted in
such quantity as to render it an article of commerce or
of profit. Besides those already mentioned, numerous vegeta-
bles, seeds & volatile oils contain it. Some of them are in
the following order, the *Almonum* *Cardamomum*, *peper*
Cubana, *Thymus* *serpyllum* & *Vulgaris*, *Asmarinus officinalis*,
Mithra *perfoliatus*, *Salvia officinalis* & the essential oils of *Majorana*
Savendero, *Peripetum* & *Sage*. From its being thus diffused thro-
out nature it is therefore now universally considered as a
peculiar principle of vegetables, and not a new organ.

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It is obtained in its impure state from the above mentioned sources by distillation, which is afterwards purified by the addition of quicklime and then is sublimed in a sublimator in the form of concave & convex masses of different thickness, by the application of heat to the vessel containing the impure compound. It is in this state we import it from Europe & Asia. Camphire thus (or we receive it) is a concretible substance, of a white colour with a considerable degree of transparency and crystalline appearance, specific gravity less than water. Its taste is bitter and acrid and its smell penetrating and peculiar. It evaporates at the temperature of 150° unchanged, but suddenly melts when exposed to a degree of heat above 302° of Fahrenheit. Its vapour is exceedingly inflammable and when kindled it burns with a very white flame and a great deal of smoke and leaves no residue. Its composition is not well understood; but according to the received opinion of the present day it consists of Camphoric acid and a peculiar base. This acid is obtained from Camphire by repeated distillation with nitric acid.

The solvents of Camphire are the concentrated acids, different kinds of Ethers, alcohol, spirits of various kinds, oils fixed & volatile. Milk has been used to dissolve, rather suspend it; ^{mentas} this was thought to be a valuable preparation; but experience convinces us that it answers no important purpose, unless used at the moment of preparation or during very cold weather on account of its liability to fermentation by which its properties become changed or totally destroyed. It may be suspended in various ways by the addition of different gums. It may also be diffused in water when reduced to an impalpable powder previously, by rubbing it with sugar or any

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hard substance and then stirring or agitating the mixture;
but in this state it will not remain long when set aside.

In the third volume of the Philosophical Transactions Dr. Bar-
low gives us the result of some experiments made by himself
in order to ascertain the efficacy or inefficacy of Camphire in
promoting vegetation. By them he was convinced that it not only
possesses the property of affording nourishment to plants when placed
in water impregnated therewith, and increasing their growth and vigour,
but that it also possesses the singular property of resuscitating such
as were considerably shrivelled and an apparently destitute of
Vitality. In reading his observations I was struck with a strong
anomaly which he rebated! He observes whenever he used a
certain quantity the growth, the vigour, the luxuriance and the
colours were always increased; but upon increasing the quantity
instead of the same effect being produced, the destruction of the
plant was the inevitable consequence. In those instances the destruc-
tion or death was preceded by a sphaculation of ^{the} leaves & falling
off of the petioles. I candidly confess that upon this subject
I have never made any experiments to prove or disprove the
result of Dr. Barlow's; but I do not hesitate to declare my sin-
cere belief of the facts related and that therefore upon them
I draw this conclusion, whenever camphire is used to a certain
extent it increases the growth and vigour of vegetables; but on
the contrary whenever the quantity is increased, it tends to their
destruction.

Having thus given a short sketch of the natural History of
Camphire, enumerated its virtues, and said a few words on its com-
parative efficacy, ⁱⁿ promoting vegetation, I shall in the next place

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proceed to relate some of those experiments which I made during the
Months August, September & October. Beginning in the first place permit
me to state those inconveniences under which I then laboured and
to enquire into their magnitude in facilitating or preventing the correct-
ness of things. The first inconvenience is that they were all made
upon my self. How far the operation of the mind tends to influence or
to counteract their results I will not pretend to say; but in almost every
instance my pulse was examined by several of my friends whose kind
help and attention enabled me to proceed with more ease and certainty.
The second is the partial distension of the stomach. This I infer from
the space of time being not sufficient for the stomach to perform its
function and then to evacuate its contents. I generally began from 1 hour
 $4\frac{1}{2}$ to 2 hours after breakfast or the same length of time after tea.
Laying these inconveniences aside I am then confident as
to the result of those which will be related.

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Experiment 1 14

On 21st August, my pulse beating 63 strokes in a minute I took 6 grains of Camphore rubbed down with white sugar and then diffused in a warm glass full of water with the following alterations in the frequency of the pulse at the subsequent different periods of time

Min	5	10	15	20	25	35	50	60	80	90	110	120
N. Pulse	67	69	70	71	74	70	74	75	76	76	78	76

There was no sensible difference with respect to the relative state of the stomach, neither was there a preternatural sensation of heat on the surface of the body in consequence of my exposure to a gentle breeze of air in order to restrain sweating. By this exposure sweat was effectually restrained; but there was evidently an increased secretion of urine, a pale and almost transparent colour with no perceptible difference in its odour.

Experiment 2

On the 22nd my pulse beating 71 strokes in a minute I took 10 grains dissolved in butter with the following result

5	10	15	20	25	30	40	50	60	70	80	90	110	120
80	78	76	72	71	71	67	66	66	65	65	61	62	61

For the first 20 minutes it will be seen that the frequency of the pulse was increased; but afterwards there was a gradual diminution as force & frequency during the remaining time. The symptoms which occurred are in the following order, a sensation of increased heat in the stomach, then a diffusion of it over the whole body, an elevation of spirits and vivacity of mind; an apparent increased strength in the muscular system. They occurred during the respiration of the first hour or so long as sweat was restrained which as in the preceding experiments I endeavoured to prevent by exposure to a draught of fresh air through a window. After 60 minutes

[Faint, mostly illegible handwritten text in cursive script, likely a ledger or account book.]

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notwithstanding my efforts to the contrary ~~to the contrary~~, a cold, clammy sweat partially pervaded the surface of the body which appeared to decrease the temperature thereof by its evaporation. By this diminution of heat aided by the decreased frequency of the pulse numerous other symptoms ensued, which were depletion of spirits, giddiness, drowsiness, chillings, lassitude, disinclination to stir about and oppression at the stomach with an occasional eructation of froth & gas impregnated with the odour of Camphire. When the two hours expired I walked about the house; but I still felt debilitated until I got dinner a short time afterwards which entirely banished all the symptoms then present.

Experiments 3

On 27th of August at 10 A.M. my pulse beating 71 strokes in a minute I took 12 grains which was previously divided by rubbing it down with white sugar and then taken in the dry state with the following result:

5	10	15	20	30	40	50	60	70	80	90	100	110	120
73	75	74	72	70	70	68	66	65	63	60	60	62	62

This & the three succeeding experiments were made while lying in bed. And in order to ascertain the frequency of the pulse with greater accuracy the dose was not taken until I had been perfectly at rest for 30 minutes previous to. The symptoms which occurred were not remarkable; there was a pleasurable sensation of heat in the stomach attended with full but soft pulse and an occasional eructation of gas; easy and full respiration; urine scanty & highly coloured with no sensible alteration in its odour; copious sweat after the expiration of 50 minutes which lasted until I got up sometime afterwards but no perceptible difference in its odour; no inconvenience resulted from this copious sweat, I was enabled to attend to my business as usual.

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Experiment 4th

In the evening of 2nd Sept.^r my pulse being raised to 60 strokes in a minute by a catarrh which I then had, I took ten grains prepared as in the 3rd Experiment and in the same manner with the following result. 5 10 15 20 25 30 Copious sweat now supervened which continued between 2 and 3 hours; during which time the pulse was very full but soft; the cough and irritation of the Trachea were suspended or considerably alleviated; but as soon as the sweat was discontinued they returned with redoubled violence, accompanied with restlessness, hot and dry skin and other symptoms of fever which lasted until between 4 & 5 O'clock in the morning when I fell asleep and thereby had a few hours repose. From 9 O'clock until 6 I had no sleep, nor the least inclination to indulge myself in that way; during which time my mind was unusually active, wondering from subject to subject and from scene to scene.

Experiment 5th

On the 8th Sept.^r at 10 A.M. my pulse beating 75 strokes in a minute I took 10 grains prepared as in the two preceding experiments and the following result. 5. 10. 15. 20. 25. 30. 40. After this period 78. 77. 77. 74. 72. 72. 69. no particular attention was paid to the frequency of the pulse, but it continued to decrease as long as sweat, which supervened at the expiration of 35 minutes was promoted by a still longer continuation in bed. There was slight nausea from the difficult digestion of Camphire, attended with frothy & greenish vomitings; full but soft pulse; increased heat of the body before sweat was induced; small quantity of urine and that highly coloured; no perceptible difference in the scent of the sweat.

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Experiment 6th

On 16th of Sept. at 10 A.M. my pulse beating 70 I took 8 grains prepared in like manner with the following result.

5. 10 15 20 25 30 40 50 60
72. 73 73 71 69 68 66 66 64

Sweat supervened after the expiration 30 minutes; pulse full & soft; no sensible impression upon the Stomach, and no other symptoms worthy of enumeration.

Experiment 7th

In order to ascertain more correctly the operation of Camphor I determin'd to try its effects when taken in divided doses. According
by on 18th my pulse beating 75, I took eleven grains dissolved in about a teaspoonful of spirit and then at the expirations of 15 and 30 minutes, the two halves of eleven grains, which had been previously divided by rubbing it with sugar, were taken with the following result. 5. 10. 15. 20. 25. 30. 40. 50. 60. 70. 80. 77. 77. 75. 73. 70. 72. 68. 66. 63.

From this period no particular attention was paid to the variations of the pulse; it however continued to be full & soft but less frequent. During the first half hour the sensations of warmth & fullness were imparted to the Stomach; after which the skin became warmer, redder, and more relaxed; the superficial veins appeared to be surcharged with blood which remains in this situation for one hour without the succession, as in former experiments of general or partial sweat: Stupor, yawning, drowsiness, giddiness, and disinclination to walk about, now common, attended with an apparent loss of preserving my head & body in their usual and proper position. I now undressed my self and went

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to bed and immediately afterwards fell asleep, which continued so profoundly as to produce a total unconsciousness of the lapse of 9 or 10 hours. The next morning I had no recollection of any thing that occurred after getting in bed. I could not discover from the bedclothes whether I had sweated during the night.

Experiment 8th

In order to ascertain the correctness of the last Experiment, I determined to repeat it, varying however, the quantity and preparation accordingly on the 23^d at 10 a.m. my pulse beating 75 strokes I took 20 grains which had been previously divided by rubbing it with sugar; and then at the expiration of 15.30 and 45 minutes severally, I particated and swallowed 16 grains of pure Camphire making in the aggregation 32 grains with the following results.

5.	10.	15.	20.	25.	30.	45.	60.
79.	78.	78.	75.	74.	70.	68.	65.

From this period my pulse continued to descend in force and frequency until it beat 60, and at which it remained for several hours, the regular minute of its variation was preserved if there should have been any. Immediately after taking the dose and until the expiration of 45 minutes no inconvenience whatever resulted; but from this period my body began to assume another aspect. The symptoms therefore which occurred from this period until the expiration of the two succeeding hours are in the following order. A sensation of heaviness and fullness in the stomach; frothy and gaseous eructations; nausea and inclination to vomit; anorexia; giddiness; small, irregular and weak pulse; full and laborious respirations; cold & clammy sweat partially pervading the surface of the body; the scent of Camphire perceptible to all present, but from what source it emanated, could not positively be

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determined, tho' it was generally thought to proceed from poor
spirations. Shortly after which dinner came on, whether
I went to partake as usual, but the disorders state of the St
mach and the consequent Nausea still continuing with
such unmitigated violence as to prevent me almost entirely
from taking any food. Whatever was taken, I intended to
obviate the disagreeable and debilitating effects produced
by this dose, rather than to gratify any pretence of appetite
which might still remain; and to assist therein a strong
mixture of Spirit and water was resorted to. From this however
I experienced no relief, on the contrary I think it tended conside-
rably to aggravate them. After dinner my situation remained
nearly the same for several hours, and during this time
my feelings were extremely unpleasant, but I feel myself
incompetent to give a just description. Suffice it to say that
I felt no acute pain, but one continued series of unea-
siness and oppression at the Stomach, attended with tremor,
dilated pupils and cold and clammy sweat from the
prostrated and debilitated state I did not entirely recover
until the next day, for until then there was no return of
appetite. My Stomach did not digest this dose in less time
than eight or ten hours, because, until after 8 hours had
elapsed, there were frothy and gaseous excretions which
evidently proved the existence of Camphire in the Stomach.
With horror I reflect upon this experiment, and it was
this, that deterred me from increasing the quantity in
any subsequent experiment.

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In addition to these, I might here relate other experiments, which were made with the same quantity of Camphire to ascertain what difference would result in the frequency of the pulse when it was exhibited in a solid or fluid form under similar circumstances; but as there was so small difference in them I shall give nothing more than their results. In several instances, the same quantity of Camphire taken in a liquid form (whether in solution, suspension, or diffusion), at the same hour of the day and after taking the same breakfast, has increased the frequency of the pulse from 5 to 10 strokes more than that very same quantity taken in a solid form. So far as I am capable of judging from them, I do not hesitate to declare my sincere belief of the fact, but to account for this difference or to give any probable explanation is a difficult task. However I believe this difference in the frequency to depend not upon an error in the experiments, but upon the direct application of the Camphire (when thus exhibited in the liquid form) to the whole or greater part of the surface of the stomach, thereby producing a more prompt and powerful reaction which is very soon communicated to the heart and arteries. I am inclined to believe this conclusion is correct, because in several cases where Camphire was taken in substance and where the frequency of the pulse was not increased before the expiration of 20 minutes, I have noticed, that it now was in a single instance afterwards, that the increased fullness would be quite evident. As far as my observation extends, I may lay it down as an axiom that unless the frequency of the pulse be increased before this

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expiration of 20 or 25 minutes, it never will be afterwards
more especially if the dose be large. Because if the experi-
ment be made with a pretty large dose while lying
in bed, we may expect sweat to succeed after the space
of 30, 40, or fifty minutes which always tends to lessen the
frequency of the pulse. And moreover suppose the experi-
ment to be made with a large dose when exposed to
the action of air, and suppose, by this means, sweat to
be restrained, it then operates so powerfully upon either
the brain or Stomach as to produce indirect debility
When its stimulus is communicated to the brain the follow-
ing symptoms will occur, elevation of spirit, intoxication,
vertigo, stupor, sleep, and sometimes death. This
state of the brain must necessarily affect respiration
indirectly by influencing the action of the Inter costal
muscles also the Diaphragm, and this must di-
rectly influence the action of the heart, consequently
the frequency will be thus lessened. The Nausea which
often succeeds the use of large doses when sweat has been pre-
vented also tends to lessen its frequency. Altho I believe
Camphor to be a powerful and diffusible stimulant I
must acknowledge that in several instances I have
taken more than 12 grains in substance without pro-
ducing an increased frequency of the pulse, even at
the commencement, before sweat was induced.
In a majority of experiments it increases the frequency
of the pulse from 5 to 12 strokes, rarely even more than
12; it universally increases its fullness in the beginning

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of which I am as confident as I am of the truth of
any problem in Euclid. Here my confidence depends
not as much upon the testimony of others or upon the
sensation imparted to my fingers as it does on the
violent throbbing of all the large arterial branches, more
especially the Carotid and Temporal. This was different
in the fullness I perceived in some of my first experiments
which were made in bed, and it ever afterwards became
so evident as not to escape my observation. Having
experienced little or no inconvenience from taking 16
grains when sweat supervened at the usual time and
which was promoted, I am induced to believe that 30
or 40 grains might be taken with impunity provided
we could be certain, that sweat would be excited in
30 or 40 minutes; but it should not, the brain or the
stomach will most undoubtedly suffer. I am firmly
persuaded that had the eight experiment been made
in bed when sweat would have been promoted, the dread
febrile effects would have been alluviated, if not prevented.
However I confess that I should dislike to make this ex-
periment. The 3^d and 5th experiments prove to my satisfaction
the stimulant power of Camphire. For though after the
expiration of 30 minutes my pulse had descended below
the natural standard and from which time it continued
to descend until I got up, partly by the profuse sweat
and partly by the long continued rest yet no inconvenience
ever resulted, I felt never debilitated. Now if Camphire be
a sedative, this profuse sweat ought to add to rather than ab-
stract from its sedative or debilitating power.